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(72) (73) Inventors and patentees:

Mr. Győző Bartos, Budapest (HU)
Mr. Péter Horn, Budapest (HU)
Mr. Lajos Lénárd, Budapest (HU)
Mr. István Molnár, Budapest (HU)
Mr. László Wéber, Budapest (HU)

(74) Representative:

Péter Kecskés, Budapest

(54) Remote-controllable single-wire supervisory television system and single-wire remote security system for detection and alarm

This invention relates to a remote-controllable single-wire supervisory television system and a single-wired remote security system for detection and alarm.

It is well known that visual security systems used for supervision, detection and alarm have to meet various demands. Complex systems of this kind can be subdivided into two major subsystems. The first subsystem is a video system facilitating supervision, having television cameras capable of video recording, further having video monitors for

image reproduction, remote-control devices, video storage devices and other accessories. The second independent subsystem comprises heat detectors, smoke detectors, touch detectors, acoustic detectors, infrared detectors and detectors of other types.

The second subsystem makes a good complement for the video subsystem. Only a fraction of the observed territory can be seen on the monitors at one time in a supervisory video system, where the view is either pre-programmed or it can be selected by hand. This is especially true for widely expanding centralized networks and networks built on a single backbone line. The two subsystems mentioned can be used collaterally, independently, or they can be completely separated. In case of a collateral implementation it is preferable to design supplementary and auxiliary system connections.

Both systems comprise a central unit and remote units distanced several kilometers away from the central unit. Output signals of the video cameras in the video system are usually transferred to the monitors in the central unit via coaxial cables. These systems are referred to as closed chain television systems (CCTV). The remote-control functions of the camera and its surroundings (manipulating optical parameters, power on/off, camera rotation, etc.) are provided in a traditional way utilizing multi-strand compound cables. An example for the above system is the "Multi Control System" composed of Panasonic units WV-7230B, WV-7435, WV7490B, utilizing control cables with 7 or 13 strands in addition to the coaxial cables.

Systems installed with separate control cables give complex and expensive systems, hence systems without control cables were developed.

In the system "Videocordon" (according to patent No. HU 185 502, developed by Híradástechnika Inc.) remote-control and regulation signals are inserted into the field blanking period of the video signal (lines 6-21 and 318-333) in the form of digital signals, thus all signals may be transferred via coaxial cable. This design requires total synchronization of all units within the system (genlock) as well as a large quantity of digital circuits or device-specific circuits for data input and output. The advantage of this design is that it provides bidirectional data transfer, therefore data may as well be transmitted from the independent detectors placed on the supervised side to the central

unit. Complex circuitry and the lack of compatibility with other CCTV units are the disadvantages of this design.

Patents US 4 949 181 and US 4 954 886 have also introduced video systems wherein video and control data are both transmitted via coaxial cable. In these designs, however, control signals are modulated in the central unit to produce signals with a carrier frequency above the video frequency band. The modulated signal is demodulated by the receiving circuitry on the supervised side. Simplicity and compatibility with other manufacturers' units are the main advantages of these systems.

The patent US 4 949 181 describes a method for centralized remote-control of a plurality of cameras where each camera is connected to the central unit through a transmission line, each transmission line having a dedicated amplifier, further each camera having a dedicated control signal receiving circuitry (filter, demodulator, decoder, control module). This arrangement is considered to be technically and economically disadvantageous, given that the television cameras are forming groups and are located close to each other (within a circle of a radius between 50-100 meters) and the control central is located far away from the cameras (500-2000 meters). Another disadvantage of this system is that it does not support data transfer from the cameras to the control central.

The patent US 4 954 886 describes a remote-controllable system that makes it possible to control a single camera independently from a plurality of places in the control central. However, this design does not support controlling a group of cameras through a single line. Furthermore, said design does not enable data transfer from the cameras to the control central.

We may see that the microprocessor-controlled security systems "Allegiant" (types TC8500 and TC8500X) and "Allegiant II" (types TC8700 and TC8700X) developed by Burle Industries Incorporated's Security Product Division feature separate compound cables for the video system and the detection system. This layout has the drawbacks mentioned above.

It is therefore an object of the present invention to provide a more cost-efficient and simple video system retaining the advantages of the formerly described video system utilizing a carrier frequency for control signals. Yet another object of the present

invention is to provide a matching security system equipped with means for detection and alarm. Still another object of the present invention is to provide single-wired bidirectional signal transmission within both systems.

Namely we have discovered that grouped cameras can be selected and remote-controlled simply and more economically if we operate all cameras using one common device for signal reception and distribution instead of having a dedicated receiving device installed for each camera.

We have also discovered that data acquired from the detectors of the security system may as well be transmitted in the inverse direction (from the receiving and distributing unit to the central unit) utilizing the channel used for transmitting video data. These signals are transmitted on a carrier frequency outside the video frequency band.

Our idea to combine a remote-controllable single-wire supervisory television system and a single-wire remote security system was partly induced by recognizing that the carrier frequency-modulated detection signal of the single-wire remote security system may be implemented in the intercarrier frequency band, e.g. set to 5.5 MHz according to the CCIR (Comité Consultatif International des Radiocommunications), while the carrier frequency for the supervisory television system's remote-control signals may be set to 6.5 MHz according to the OIRT (Organisation Internationale de Radiodiffusion et Télévision.). The frequencies of said signals are interchangeable.

When using FM modulation, setting carrier frequencies according to the above pattern enables the use of mass production ceramic band-pass filters.

Therefore, the present invention relates to a remote-controllable single-wire supervisory television system; the present invention also relates to a single-wired remote security system for detection and alarm. The systems comprise the following components: central supervisory controlling unit; receiving and distributing unit; camera or detecting unit; optional duplex amplifier. One of the outputs of a control signal encoder in the central supervisory controlling unit of the remote-controllable single-wire supervisory television system is connected to the input of a modulator. The output of the modulator is connected to the input of the first integrator through a first intercarrier frequency filter, an output of the first integrator is connected to the input of a monitor through a low-pass filter, further the commoned input-output of the first integrator is

connected - either directly via transmission line or through an optional duplex amplifier integrated into the transmission line - to the commoned input-output of a second integrator in the receiving and distributing unit. The output of the second integrator is connected to the input of a demodulator through a first intercarrier signal filter, and the output of the demodulator is connected to the input of a control signal decoder. According to the present invention, the output of the control signal decoder in the remote-controllable single-wire supervisory television system is connected to the input of a mode switch. The first output of the mode switch is connected to the input of a driver stage and the second output of the mode switch is connected to the input of the video signal switch. The outputs of the driver stage are connected to the remote-control inputs of the camera units. The video signal outputs of the camera units are connected to the video signal inputs of the video signal switch, and the output of the video signal switch is connected to one of the inputs of the second integrator.

According to the present invention, the output of a detector signal encoder in the security system is connected to the input of a modulator. The output of the modulator is connected to the input of a first integrator through a first intercarrier frequency filter, further the commoned input-output of the first integrator is connected - either directly via transmission line or through an optional duplex amplifier integrated into the transmission line - to the commoned input-output of a second integrator in the receiving and distributing unit. The output of the second integrator is connected to the input of a demodulator through a first intercarrier signal filter, and the output of the demodulator is connected to the input of a detector signal decoder. According to the present invention, the output of the detector signal decoder within the receiving and distributing unit of the security system is connected to the code input of a detector switch. The other inputs of the detector switch are connected to a plurality of detectors. The output of the detector switch is connected to the input of a modulating signal generator. The output of the modulating signal generator is connected to the input of a detector signal modulator, and the output of the detector signal modulator is connected to the second input of the second integrator through a second intercarrier filter. Further the commoned input-output of the second integrator is connected - either directly via transmission line or through an optional duplex amplifier integrated into the transmission line - to the commoned input-

output of a first integrator in the central supervisory controlling unit. The second output of the first integrator is connected to the input of a detector signal demodulator through a second intercarrier signal filter, and the output of the detector signal demodulator is connected to an input of an alarm signal switch. The other inputs of the alarm switch are connected to a plurality of switch signal outputs of a detector signal decoder. The alarm signal outputs of the alarm switch are connected to an alarm signal display. A code switch is connected to the first input of the detector signal encoder, while the second input of the detector signal encoder is connected to the second output of the control signal encoder. The output of the detector signal encoder is connected to the input of the detector signal decoder.

The features and advantages of the present invention will be more clearly appreciated from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block diagram of a remote-controllable single-wire supervisory television system and a single-wire remote security system according to the present invention.

FIG. 2 is a block diagram of a backbone network implementation of a system according to the present invention.

In the supervisory television subsystem of the system seen on FIG. 1, one of the outputs of a control signal encoder KD1 in the central supervisory controlling unit is connected to the input of a modulator MD1. The output of the modulator MD1 is connected to the input of a first integrator O1 through a first intercarrier frequency filter SZ1, an output of the first integrator O1 is connected to the input of a monitor MO through a low-pass filter SZ2, further the commoned input-output of the first integrator O1 is connected - either directly via transmission line AV or through an optional duplex amplifier DE integrated into the transmission line AV - to the commoned input-output of a second integrator O2 in a receiving and distributing unit B. The output of the second integrator O2 is connected to the input of a demodulator DM1 through a first intercarrier signal filter SZ4, and the output of the demodulator DM1 is connected to the input of a control signal decoder DK1.

The output of the control signal decoder DK1 is connected to the input of a mode switch UV. The first output of said mode switch is connected to the input of a driver

stage MH and the second output of said mode switch UV is connected to the input of a video signal switch VK. The outputs of the driver stage MH are connected to the remote-control inputs of a plurality of camera units K1, K2, Kn, and the video signal outputs of said camera units K1, K2, Kn are connected to the video signal inputs of the video signal switch VK. The output of said video signal switch VK is connected to one of the inputs of the second integrator O2.

The output of a detector signal encoder KD2 in the security system is connected to the input of a modulator MD1. The output of the modulator MD1 is connected to the input of a first integrator O1 through a first intercarrier frequency filter SZ1, further the commoned input-output of the first integrator O1 is connected - either directly via transmission line AV or through an optional duplex amplifier DE integrated into the transmission line AV - to the commoned input-output of a second integrator O2 in the receiving and distributing unit B.

The output of the second integrator O2 is connected to the input of a demodulator DM1 through a first intercarrier signal filter SZ4, and the output of the demodulator DM1 is connected to the input of a detector signal decoder DK3. The output of the detector signal decoder DK3 within the receiving and distributing unit B of the security system is connected to the code input of a detector switch EK. The other inputs of the detector switch EK are connected to a plurality of detectors E1, E2, En. The output of the detector switch EK is connected to the input of a modulating signal generator MJ. The output of the modulating signal generator MJ is connected to the input of a detector signal modulator MD2, and the output of the detector signal modulator MD2 is connected to the second input of the second integrator O2 through a second intercarrier frequency filter SZ5. Further the commoned input-output of the second integrator O2 is connected - either directly via transmission line AV or through an optional duplex amplifier integrated into the transmission line AV - to the commoned input-output of a first integrator O1 in the central supervisory controlling unit A. The second output of the first integrator O1 is connected to the input of a detector signal demodulator DM2 through a second intercarrier signal filter SZ3, and the output of the detector signal demodulator DM2 is connected to an input of an alarm signal switch RK. The other inputs of the alarm switch RK are connected to a plurality of switch signal outputs of a detector signal decoder

DK2. The alarm signal outputs of the alarm switch RK are connected to an alarm signal display RJ. A code switch KK is connected to the first input of the detector signal encoder KD2, while the second input of the detector signal encoder KD2 is connected to the second output of the control signal encoder KD1. The output of the detector signal encoder KD2 is connected to the input of the detector signal decoder DK2.

In the following we will discuss the layout and the operation of the video supervision system. The control signal encoder KD1 is equipped with an SAA1250 type IC (integrated circuit) designed for use in infrared remote-control senders. The inputs of the IC can be selected with a matrix system using push buttons. When a control command is sent, the control signal encoder KD1 sends a disabling signal to the signal encoder KD2 of the security system (to be discussed later on). According to a basic embodiment of the present invention, the encoding IC provides three possible remote-control modes for eight cameras. The number of remote-controllable cameras can be easily increased to sixteen or thirty-two cameras using a simple circuit expansion.

The coded output signal of the control signal encoder KD1 modulates the modulator MD1 (preferably an FM modulator). The frequency is preferably set to 6.5 MHz intercarrier frequency. The stroke adjustment of the modulator MD1 is approximately ±70 kHz, while the output level can be set according to the length of the transmission line AV comprising a coaxial cable. The intercarrier frequency is above the video band (5 MHz); another benefit achieved by this choice is that mass production ceramic filters may be used in the system. One of these ceramic filters may be used as the first intercarrier frequency filter SZ1, through which the modulated signal passes from the first integrator O1 (comprising coupling capacitors) to the transmission line AV, a coaxial cable. Depending on the length of the cable, the signal passes either directly, or through an optional duplex amplifier DE to the receiving and distributing unit B. After decoupling, the signal passes through a band-pass filter realized by a first intercarrier frequency filter SZ4. After passing the first intercarrier frequency filter SZ4, the signal passes to the input of a demodulator DM1. Demodulation is implemented by a TBA120T type IC. Said IC generates digital code on its output to be decoded by an SAA1251 type IC designed for use in infrared remote-control receivers. An SN7445 type IC generates decimal code based on the BCD code read from the program output of said SAA1251

type IC. The decimal code passes to the input of a mode switch UV. Depending on the characteristics of the given command, the mode switch UV passes it to the driver stage MH comprising transistors and relays controlling various parameters of the camera, or to the input of a video signal switch VK selecting video signals of similar cameras K1, K2, Kn.

The selected video signal goes through the second integrator O2 traveling in the inverse direction on the coaxial cable (optionally through the duplex amplifier DE) as it passes from the output of the video signal switch VK to the central supervisory controlling unit A. After it is decoupled in the first integrator O1, the signal passes a 5MHz low-pass filter SZ2 and is displayed on a monitor MO. The synchronization of encoding and decoding processes is established by setting identical modes for the integrated circuits used for encoding and decoding.

The security system operates as described below. The detector signal encoder KD2 is also equipped with an SAA1250 type IC designed for use in infrared remote-control senders. When there is a query for the status of the detectors – that is, there is no remote-control in the supervisory video system – the detector signal encoder KD2 receives an enabling signal from the control signal encoder KD1. In this case, the detector signal encoder KD2 returns the code groups corresponding to detectors E1, E2, En, according to the signal of the code switch KK. The code switch KK comprises a stabilized multivibrator. This signal passes to the input of the modulator MD1, and it also passes to the input of the detector signal decoder DK2. The latter stage assures the identification of the return signal detector. The FM signal emitted by the output of the modulator MD1 passes through the stages described above and is demodulated in the receiving and distributing unit B. The demodulated code package is decoded by the detector signal decoder DK3 based on its contents. The detector signal decoder DK3 is also equipped with an SAA1251 type IC designed for use in infrared remote-control receivers. The BCD code read from the output of the IC is converted into decimal code as described above. In the detector switch EK said decimal code is utilized for the sequential control of a switch array. The inputs of the switches are connected to the detectors E1, E2, En of the security system. In case of an alarm, the signal emitted by the detector activates a modulated signal generator MJ through the switch. The modulated signal

generator MJ may be a low-frequency multivibrator. The modulating signal modulates the detector signal modulator MD2. The detector signal modulator MD2 is also an intercarrier FM frequency stage; however, the carrier frequency in this case is 5.5 MHz. The operative settings of the modulator MD2 are identical to those of the modulator MD1. After passing through a second ceramic intercarrier frequency filter SZ5 and through the second integrator O2, the modulated signal is transmitted via transmission line AV comprising a coaxial cable. Therefore, three different signals are transmitted simultaneously on the coaxial cable: 6.5 MHz FM signal, 5.5 MHz FM signal and a selected video signal. The 5.5 MHz FM signal travels in the inverse direction. After the signal passes the coaxial cable through the optional duplex amplifier, it is decoupled in the first integrator O1 and is demodulated by the detector signal demodulator DM2. Demodulation is implemented by a TBA120T type IC. The detector signal decoder DK2 sends decoded switching signals to the alarm signal switch RK, said alarm signal switch RK comprising a controllable switch array. The alarm signal switch RK forwards the alarm signal to the alarm signal display RJ. Upon reception of the alarm signal, the alarm signal display RJ raises an alarm resulting in acoustic signals, light signals or other alarm warnings.

In case of a backbone-layout network seen on FIG. 2, the system comprises a central supervisory controlling unit A. The system further comprises a plurality of remote-controlled and/or remote-selected groups I, II, k connected to the single-wire transmission line AV directly, or through an optional duplex amplifier DE. Each group comprises the following components: selecting switch J; filter SZ6; receiving and distributing unit B; camera C and/or detecting unit. The output of the central supervisory controlling unit A is connected to one of the inputs of the selecting switch J either directly via transmission line AV or through an optional duplex amplifier DE integrated into the transmission line AV. An output of the selecting switch J is connected to one end of the filter SZ6 and to the input of the receiving and distributing unit B. An output of the receiving and distributing unit B is connected to another input of the selecting switch J, and another output of the receiving and distributing unit B is connected to the input of the camera C and/or another detecting unit. Another output of the selecting switch J and the other end of the filter SZ6 are connected to the input of the remote-controlled and/or

remote-selected group II directly via transmission line AV, or through an optional duplex amplifier DE integrated into the transmission line AV. Furthermore, the output of the remote-controlled and/or remote-selected group (k-1) is connected to the input of the remote-controlled and/or remote-selected group (k) directly via transmission line AV, or through an optional duplex amplifier DE integrated into the transmission line AV.

The selecting switch J of the backbone system is built of relays. During remote-control or remote-selection, the signal passes through the resting contacts of the relay in the remote-controlled and/or remote-selected group I, II, k. In this case, the signal passes through the 5.5 MHz and the 6.5 MHz parallel filters SZ6. After said signal is decoded in the receiving and distributing unit B, the relay is switched on. At this point, current group is connected to transmission line AV (also meaning connection to other groups) solely through said filter SZ6. Therefore, the video signal remains connected throughout the whole system; remote-control and/or remote-selection functionality is continuously retained for each group. The selected video signal reaches the central unit through the contacts of the functioning relay.

Compared to the prior art, the present invention allows for simple and economical design of complex and versatile video supervision systems and security systems. It is yet another advantage of the invention that it may be adopted for systems installed according to prior art. Thus, prior art systems may be upgraded according to the invention.

Claims:

1. Remote-controllable single-wire supervisory television system comprising:
at least one central supervisory controlling unit;
at least one receiving and distributing unit;
at least one camera unit;
at least one duplex amplifier (optional),
one of the outputs of a control signal encoder in the central supervisory controlling unit of the system is connected to the input of a modulator, the output of said modulator is connected to the input of a first integrator through a first intercarrier frequency filter, an output of said first integrator is connected to the input of a monitor through a low-pass filter, further the commoned input-output of said first integrator is connected - either directly via transmission line or through an optional duplex amplifier integrated into the transmission line - to the commoned input-output of a second integrator in said receiving and distributing unit, further the output of said second integrator is connected to the input of a demodulator through a first intercarrier signal filter, and the output of said demodulator is connected to the input of a control signal decoder,

wherein the output of said control signal decoder (DK1) is connected to the input of a mode switch (UV), the first output of said mode switch is connected to the input of a driver stage (MH) and the second output of said mode switch (UV) is connected to the input of a video signal switch (VK), the outputs of said driver stage (MH) are connected to the remote-control inputs of a plurality of camera units (K1, K2, Kn), and the video signal outputs of said camera units (K1, K2, Kn) are connected to the video signal inputs of said video signal switch (VK), further the output of said video signal switch (VK) is connected to one of the inputs of said second integrator (O2).

2. Remote-controllable single-wire supervisory television system according to claim 1, wherein said control signal encoder (KD1) comprises an SAA1250 type IC designed for use in infrared remote-control senders or an equivalent of a different type; said control

signal decoder (DK1) comprises an SAA1251 type IC designed for use in infrared remote-control receivers.

3. Single-wire remote security system for detection and alarm comprising:
at least one central supervisory controlling unit;
at least one receiving and distributing unit;
at least one detecting unit;
at least one duplex amplifier (optional),
said system having a signal encoder connected to the input of a modulator, the output of said modulator is connected to the input of a first integrator through a first intercarrier frequency filter, further the commoned input-output of said first integrator is connected - either directly via transmission line or through an optional duplex amplifier integrated into said transmission line - to the commoned input-output of a second integrator in the receiving and distributing unit, the output of said second integrator is connected to the input of a demodulator through a first intercarrier signal filter, and the output of said demodulator is connected to the input of a detector signal decoder,

wherein the output of the detector signal decoder (DK3) within the receiving and distributing unit (B) of the security system is connected to the code input of a detector switch (EK), the other inputs of said detector switch (EK) are connected to a plurality of detectors (E1, E2, En), further the output of said detector switch (EK) is connected to the input of a modulating signal generator (MJ), the output of said modulating signal generator (MJ) is connected to the input of a detector signal modulator (MD2), the output of said detector signal modulator (MD2) is connected to the second input of a second integrator (O2) through a second intercarrier frequency filter (SZ5), the commoned input-output of said second integrator (O2) is connected - either directly via transmission line (AV) or through an optional duplex amplifier integrated into said transmission line (AV) - to the commoned input-output of a first integrator (O1) in said central supervisory controlling unit A. The second output of said first integrator (O1) is connected to the input of a detector signal demodulator (DM2) through a second intercarrier signal filter (SZ3), the output of said detector signal demodulator (DM2) is connected to an input of

an alarm signal switch (RK), the other inputs of said alarm switch (RK) are connected to a plurality of switch signal outputs of a detector signal decoder (DK2), the alarm signal outputs of said alarm switch (RK) are connected to an alarm signal display (RJ), a code switch (KK) is connected to the first input of said detector signal encoder (KD2), while the second input of said detector signal encoder (KD2) is connected to the second output of said control signal encoder (KD1), further the output of said detector signal encoder (KD2) is connected to the input of said detector signal decoder (DK2).

4. Single-wire remote security system for detection and alarm according to claim 3, wherein said detector signal modulator (MD2) is an intercarrier frequency modulator; said second intercarrier filters (SZ3, SZ5) are fitting ceramic band-pass filters.